The Pediatric History and Physical Exam

Written Presentation Guidelines

LCDR Adam L. Hartman, MC, USNR
Medical Student Site Director, NMCSD

Introduction

This brief manual is designed for third year medical students performing the Pediatric Clerkship. It is not exhaustive. It is designed to make a few key points about taking a history and performing a physical exam on children of varying ages. There are a few pointers on how to approach various points in the clinical encounter. Any questions or requests for demonstrations should be directed to the clerkship director or a supervising physician. The references listed at the end have a more thorough discussion of the points made here. There are a few points to remember. The reason for the visit must always be addressed, regardless of how trivial it may seem. Different words mean different things to different people. What we say as health care providers can have a significant influence on the patient's or parents' perception of a situation.

History

A number of factors distinguish the pediatric from the adult history and physical exam. Depending on the age of the patient, the primary historian may be the patient and/or another person, usually the parent. Developmental factors are commonly considered. The differential diagnosis of a condition may vary depending on the age of the patient. Health care maintenance (e.g., immunizations and safety issues) and social issues play a major role in emergent and routine care.

General
Date
Patient's name
Birth date
Gender
Informant (incl. relationship to patient and perceived reliability)

Chief complaint
In the patient's or informant's words, a brief description of why the patient presented for medical care that day. The listener needs to be sensitive to this possibility that the stated chief complaint might not be the only reason the patient presents for care (e.g., child maltreatment).

History of the Present Illness
The details of the chief complaint should be expanded in this section. For example, if the chief complaint is pain, the key factors to note are its location, chronology, quality, severity, exacerbating/relieving factors, associated symptoms and the setting in which it occurs. The effect of medication on the pain (or the chief symptom) should be noted. A helpful statement includes when the patient was last in a state of normal health. Pertinent

items from the Review of Systems should be included here. Try to discover why the chief complaint is a concern. Child maltreatment should be considered if the history and physical exam are not consistent with one another or if there is a delay in seeking care for a serious injury. Any pertinent prior laboratory or radiology studies should be noted here.

Past Medical History

The patient's significant past medical problems are delineated. Common questions used include those that ask about past hospitalizations, surgeries, and reasons for ongoing care. Sometimes, the past use of a specific medication may be a useful indicator (e.g., the use of albuterol for episodes of respiratory problems). Also record the following: recent history of travel or visitors from other countries; a history of recent exposures (e.g., to other sick people or to environmental factors); the effect of an illness on a child's general activity, feeding, and elimination behavior; objective data, such as peak flow meter readings. Other items to discuss include prenatal, birth, neonatal, and feeding histories. The relative importance of these items depends on the age of the patient and the reason for the visit (i.e., in general, the birth history is not significant for an acute minor trauma visit for an adolescent).

Prenatal history

Important items include the mother's age at delivery, gravidity/parity and history of spontaneous abortions (miscarriages); maternal past medical history (including diabetes or eclampsia/pre-eclampsia; presence of oligo- or polyhydramnios; known fetal abnormalities; results of amnioscentesis; maternal and paternal medications at the time of conception and through the pregnancy; maternal and paternal occupational exposures before and after conception; maternal and paternal smoking; alcohol, homeopathic product, and illicit substance use; maternal uterine abnormalities; weight gain; vaginal bleeding; fetal movement; maternal pet exposure and meat ingestion).

Birth and neonatal histories

Items include duration of labor and pregnancy, duration of ruptured membranes, maternal treatment with medications and their timing (e.g., antibiotics and anesthetic agents), induction with pitocin, presentation (vertex vs. breech), method of delivery (including forceps or vacuum extraction), birth weight, Apgar scores, interventions in the delivery room, length of stay in the hospital after birth, diagnosis of hypoglycemia, hypothermia, anemia, convulsions, respiratory distress, or jaundice, maternal and paternal bonding.

Feeding history

Items include initial feeding by breast or bottle (including the frequency and duration/quantity), presence of maternal let-down, quality of latching and suck, preparation of formula, perception of the infant's satisfaction with the feeds, introduction of solids (including quality and quantity of solids, any adverse reactions to foods), nutritional supplementation (incl. fluoride), nutritional balance, meal frequency, fluid intake (including milk, juice, water, and sports drinks)

Allergies
Include allergies or adverse reactions to any medications or homeopathic preparations. Remember that some parents do not consider over the counter drugs to be medication. The type of reaction should also be noted (e.g., hives, emesis, dystonia), since may perceived "allergies" are really idiosyncratic reactions.

Medications
Inquire about any medications the patient is taking. It is sometimes helpful to ask specifically about antipyretics, over the counter cold medications, and homeopathic preparations, since some parents do not consider these to be medication. Ask about the need for SBE prophylaxis.

Immunization history
Include immunizations and any adverse reactions to them in this section.

Screening history

It is sometimes useful to include data from routine screens, in part, to ensure that they have been done (e.g., newborn screen, hematocrit, urinalysis, PPD).

Developmental/Behavioral history
Inquire about the current developmental progress (see Denver Developmental Screening Test II) as well as the attainment of major milestones in all major streams of development (gross motor, visual-motor/problem-solving, language, and social/adaptive); dental eruptions; general disposition; history of colic, toilet training, temper tantrums, biting, head-banging, phobias, pica, and night terrors; methods of discipline; sleep.

Social history
Ask about who lives at home with the patient, including extended family members and family friends; smokers; parents' jobs (including rate/rank and command); deployments/TADs; level of parental education; sibling relationships.

Family history
Construct a family tree that includes the last two generations (prior to the generation of the proband). Ask specifically about childhood diseases or adult diseases with childhood onset; history of consanguinity; unexplained recurrent miscarriages or SIDS. Also ask specific questions about family history that is related to the patient's chief complaint.

HEADDSS for the adolescents
Ask about how things are going at home and school, including current grade level; alcohol use; illicit drug use; depression; sexual activity; suicide; exposures to violence, including weapons.

Review of systems
Include organ systems pertinent to the chief complaint in the HPI section.

General: fever, weight change, overall appearance to the parent, appetite, elimination habits, activity level, ability to keep up with peers, insertion of foreign objects, heat/cold intolerance
Head: injuries, headache
Eyes: visual changes, crossed or tendency to cross, discharge, redness, puffiness, injuries, corrected vision
Ears: difficulty hearing, discharge, tinnitus, lightheadedness, vertigo, pressure equalizing tubes
Nose: injury, congestion, discharge, epistaxis, olfactory sense
Mouth: injury, sore throat, swallowing difficulty, dental abnormalities, teething, mouth breathing, snoring
Neck: pain, swollen noes, masses, stiffness, symmetry
Lungs: shortness of breath, chest tightness, cough, wheeze, hoarseness, hemoptysis, chest pain
Heart: cyanosis, edema, heart murmurs
Breast: masses, pain, nipple discharge
Gastrointestinal: emesis (incl. whether it is bilious or bloody), abdominal pain, frequency of bowel movements, diarrhea (incl. whether it is bloody), encopresis, colic, jaundice
Genitourinary: dysuria, frequency, urgency, nocturia, enuresis, hematuria, vaginal/penile discharge, pain, injury, menarche
Extremities: deformities, joint pain/swelling/warmth/erythema, muscle pain, cramps
Neurologic/psychiatric: mental status changes, agitation, disorientation, mood change, weakness, paresthesias, fainting, incoordination, tremors
Skin: rashes, itching, color change, hair/nail problems, easy bruising/bleeding

Physical Exam

The most critical initial question in Pediatrics is whether or not the patient is actually ill. Observation of the patient prior to the actual exam can be tremendously helpful in making this determination. Non-threatening touch can facilitate an exam. In contrast to examining older patients, the pediatric exam should start with the organ systems requiring the greatest amount of cooperation. This may vary depending on the type of exam required. In the normal infant, this is usually the cardiovascular and pulmonary exam. The head and neck exam tends to be the most disturbing to the patient and should be deferred until the end of the exam. In older infants and toddlers, most of the exam can be more successfully accomplished in the parent's lap than on a cold exam table. The exam should be performed as expeditiously as possible – the longer it takes, the more the patient (and the parent) will be bothered and, subsequently, the more difficult the exam will become. Telling a story, examining a doll the patient brought to the clinic, or engaging the patient in a conversation can significantly decrease the stress associated with the exam for both the patient and the examiner. Older children and adolescents should be addressed and treated as individuals. Please respect their desire for modesty – this may require asking a parent to leave the exam room for certain parts of the examination. A chaperone should be present if dictated by local hospital policy. In

general, exams involving breasts or genitalia by examiners of the opposite gender require the presence of a chaperone.

Vital signs

Vital signs in Pediatrics include temperature, heart rate, respiratory rate, blood pressure, pulse oximetry, weight, height/length, and head circumference.

Temperature may be elevated with infections, hyperthyroidism, tumors, autoimmune disease, environmental exposures, certain medications, or increased activity; they may be decreased with infections (esp. in neonates), hypothyroidism, certain medications, environmental exposures, shock, or CNS disease affecting the hypothalamus.

Age-appropriate normal values are available for heart rate, respiratory rate, and blood pressure. An elevated heart rate is seen with infections, hyperthyroidism, hypovolemia, and anxiety; one rule of thumb is that the heart rate increases by 10/minute for each temperature increase of one degree Centigrade. Bradycardia is seen in hypertension, increased intracranial pressure, certain intoxications, or other hypometabloic states.

Tachypnea is seen with increased activity, fever, hypermetabolic states, or respiratory distress. A decreased respiratory rate is seen with conditions affecting the central nervous system, including medications/toxins, congenital malformations, and other lesions. A variable respiratory rate, known as periodic breathing, is commonly seen in neonates but more than a 20 second pause is always abnormal. Cheyne-Stokes breathing is seen with brainstem abnormalities.

Blood pressure must be measured with a cuff wide enough to cover at least two-thirds of the extremity; its bladder should encircle the entire extremity. Systolic hypertension is seen with anxiety, renal disease, coarctation of the aorta, essential hypertension, and certain endocrine abnormalities. Diastolic hypertension occurs with endocrine abnormalities and coarctation of the aorta. Hypotension occurs in hypovolemia and other forms of shock.

Weight, height/length, and head circumference should be plotted on growth curves. A decrease in percentile for weight may be due to decreased intake (e.g., malnutrition, central nervous system abnormalities), malabsorption (e.g., cystic fibrosis, inflammatory bowel disease, celiac disease, parasitic infestations), or an increased metabolic rate (e.g., hyperthyroidism, congestive heart failure). Increased weight is most commonly exogenous but may also be associated with certain genetic syndromes (e.g., Prader-Willi).

A child's length (i.e., lying flat on a table) is measured until 2-3 years of age; after that, it is measured as height (i.e., standing). There are two different types of growth curves available: one is for children aged 0-36 months (the length is measured with the child lying down) and the other is for 2-18 year-olds (the height is measured standing). Decreased height may be familial, or may be seen in conditions affecting weight (noted

previously) or independent of weight (e.g., Turner syndrome). Increased height may be familial or associated with certain genetic and endocrine abnormalities (e.g., cerebral gigantism).

Curves for growth velocities and weights-for-length are available for children in whom growth is a concern. Occasionally, it is necessary to measure upper:lower segment ratios or arm spans to look for associations with dysmorphic syndromes.

Head circumference is routinely measured until 2-3 years of age. Microcephaly may be part of a syndrome (e.g., Rett syndrome), congenital infection (e.g., CMV), or the result of abnormal brain growth (e.g., schizencephaly). Macrocephaly may be familial or may represent a pathologic state (e.g., hydrocephalus, Canavaan disease, AV malformations).

Growth curves also exist for premature infants. In general, a premature infant's growth is corrected until 2 years of age or until he is following the "normal" growth curve, whichever comes first.

General

A comment should be made about the patient's general appearance. Comments are typically focused on the patient's activity level and whether the patient appears to be ill, is interacting with the surroundings, and level of distress, if any. Comments about unusual odors appear in this section. Some children may have an unusual appearance that may be the indication of a syndrome affecting the patient.

Head

In the infant, the size and topography (i.e., flat, bulging, sunken) of the anterior fontanel should be noted. The posterior fontanel should be no larger than a fingertip at birth and closed by two months. An abnormal fontanel can be a sign of thyroid disease, metabolic bone disease, certain syndromes, or malnutrition. The topography of the skull itself should be noted (i.e., caput succedaneum, cephalohematoma, step-offs, widely-spaced sutures, etc.). The symmetry should be examined from various perspectives, including from above, for plagiocephaly (seen more commonly now since infants are spending more time on their backs). Premature infants frequently have an irregular skull shape referred to as dolichocephaly as a result of having their heads were turned to one side for prolonged periods of time in the NICU. Premature suture closure can produce an appearance characteristic of certain syndromes, including Apert's syndrome. Craniotabes (elicited by pressing gently on the parietal bone and feeling a 'ping-pong" ball effect) may be seen in normal newborns but also may be a sign of hydrocephalus, rickets, or congenital syphilis. Abnormal hair whorls and hair distribution (e.g., low-set hairline) should be noted, since they can be associated with other disorders.

Eyes

The shape and position of the eyes should be noted. Standard measurements exist for eye spacing. Any abnormal eye movements and the ability to focus on the examiner are important to note. Some infants have prominent epicanthal folds that can create the appearance of strabismus – this is called pseudostrabismus. True strabismus (which can be further examined by the use of a cover test) should be addressed and referred at the appropriate age (usually after 4-6 months), since it can lead to amblyopia if not treated. The light reflex (noting the position of a light source 12" away from each cornea) is also useful in this examination. Once a child is old enough to cooperate (usually after 4 years), visual acuity should be noted. The setting sun sign may be normal in some newborns but is more commonly a sign of increased intracranial pressure.

A bluish discoloration of the lower orbitopalpebral groove is associated with allergic disorders ("allergic shiners"); Dennie's sign is a prominent fold in this skin seen in patients with environmental allergies. The eyelids may reveal ptosis, entropion, or ectropion. The palpebral and bulbar conjunctivae may reveal pallor or injection. Focal subconjunctival hemorrhages are commonly seen in the newborn period. The pattern of injection seen with Kawasaki disease is typically peripheral, in contrast to the pattern seen with iritis, which is commonly perilimbal. Cobblestoning of the palpebral conjunctiva is seen in patients with severe environmental allergies. Any discharge should be noted. Nasolacrimal duct stenosis is the most common nonpathologic cause of eye discharge. The nasolacrimal duct may become inflamed, causing dacryocystitis.

A red reflex should be obtained to look for cataracts, retinoblastoma, retinal detachment, or chorioretinitis. The iris should be examined for a Brushfield spots (a sign often associated with Trisomy 21), a coloboma (a cleft sometimes associated with other syndromes), or Lisch nodules (seen in neurofibromatosis-1). Once the child can cooperate (usually around 4 years), a fundoscopic exam should be performed. Increased intracranial pressure is manifest by decreased venous pulsations – a blurred disk is a later sign. The macula should also be examined, as abnormalities can be associated with certain neurodegenerative disorders. Corneal clouding can be a sign of glaucoma.

Ears

The size and any physical aberrations in the shape of the external ear should be noted. Darwin's tubercles are common. The ears should be set and rotated normally – an abnormality may be an indication of certain syndromes (including Trisomy 21). There are published standards for external ear length (a long external ear is associated with certain syndromes, like Fragile X). Any preauricular pits or skin tags (a remnant of external ear development) should be noted. The pinna may appear to be protruding in the child with mastoiditis. The pinna should be manipulated to look for irritation of the skin of the auditory canal, as may be seen with otitis externa.

Examining the tympanic membranes (TMs) of an uncooperative infant or child can be a challenge. An infant's hands may be held down by the parent while the child is supine. The examiner can use her hands, while holding the otoscope and insufflation bulb, to hold the infant's head to one side. Older infants and toddlers, if uncooperative, can be

restrained in the same fashion or while being held in a tight hug by the parent. The otoscope speculum should be gently inserted into the external auditory canal. The skin in the external auditory canal should resemble normal skin. The TM should be translucent with a normal light reflex and visible landmarks, especially the manubrium of the malleus. Insufflation should be performed. Signs of otitis media include injection of the TM, pus behind the TM, bulging or retraction of the TM, and poor mobility on insufflation. Some fluid behind the TM is commonly seen for weeks to months after an episode of otitis media. Scarring of the TM is commonly seen after recurrent episodes of otitis. Abnormal opacities in the pars flaccida, however, may be a sign of a cholesteatoma. Any mastiod tenderness or swelling should be noted. Learning to manipulate the otoscope, insufflator, and pinna simultaneously require practice.

Nose

The shape, size, and symmetry of the nose should be noted. In an older child, the presence of a septal deviation, polyps, injected or boggy mucosa, rhinorrhea or other discharge, and bleeding should be recorded. Nasal polyps can be associated with a variety of etiologies, including allergic rhinitis, cystic fibrosis, and aspirin sensitivity (to name a few). Any nasal flaring should be noted in a child with respiratory distress. Tenderness over the sinuses should be noted in patients old enough to have them. Remember that the frontal sinuses do not start development until the middle of childhood. They are not fully pneumatized until adolescence. A horizontal crease may be seen in the skin on the surface of the nose; this signifies repetitive wiping of the nose commonly seen in allergic rhinitis (the “allergic salute”).

Throat/Mouth

The mouth is frequently examined after the ears, since the infant is frequently already crying. The parent can once again restrain the hands or hold an older child facing the examiner while the arms and head are held. Older children (after the age of 3-4 years) frequently are compliant with this exam. The color of the oropharynx should be noted. Cobblestoning of the posterior pharyngeal wall is a sign of chronic allergic disease. The size of the tonsils and tonsillar pillars and any discharge should be noted.

The quality of the patient’s voice should also be noted. Abnormalities might include a ‘hot potato voice’ seen in a retropharyngeal abscess or hoarseness associated with vocal cord paralysis. The arching of the palate should be noted if abnormal (a high-arched palate may be seen in certain syndromes like Marfan syndrome). Any grunting should be noted for patients in respiratory distress. A large tongue may be seen in certain syndromes (e.g., Beckwith-Wiedemann). A geographic tongue is a common finding. A smooth tongue may be seen in vitamin B12 deficiency. The buccal mucosa may have white reticular plaques commonly seen with thrush. The soft palate and gingiva in newborns may have keratin pearls (also know as Epstein’s pearls). Any cleft palate should be noted. The uvula may be bifid, possibly indicating a submucous cleft. The number and position of teeth should be noted, as delayed or advanced dentition can be caused by some of the same conditions affecting fontanel closure. Eruption cysts and

mucoceles are not uncommon in the first 6 months. Any caries should be noted. The teeth should be examined for a malocclusion. Natal teeth may be seen in the newborn period. A single central maxillary incisor can be associated with growth hormone deficiency. Maxillary hyperplasia may be seen with various forms of chronic anemia. "Tongue tie," or a shortened frenulum, is very uncommon. There should be no functional deficits if the infant can protrude the tongue beyond the gingival margin.

Neck

Any masses should be recorded, including their position (anterior vs. lateral) and consistency (firm vs. cystic vs. pulsating). The differential diagnosis of cervical masses is governed, in large part, by these findings. For example, a large cyst in the midline is frequently a thyroglossal duct cyst. A tender fluctuant lateral neck mass is frequently an infected anterior cervical lymph node (though a branchial cleft cyst needs to be considered, as well). Cystic hygromas can occur anywhere in the neck but they are usually laterally located. An enlarged parotid gland can be differentiated from a cervical node by the fact that the former is dissected in half by the angle of the mandible while the latter is found below the angle of the mandible. Parotitis, though commonly associated with mumps, is more commonly seen with other common viral infections. Carotid bruits are a common finding. The size and nodularity (if any) of the thyroid needs to be noted. A webbed neck may be a sign of Turner syndrome. The position of the neck may be important in early infancy, as torticollis has an extensive differential diagnosis. Abnormal neck mobility may be a sign of infection (e.g., meningitis or peritonsillar abscess) or trauma. Tracheal tugging or accessory muscle use may be seen with respiratory distress. The salivary glands are rarely enlarged in children.

Chest

The symmetry of the chest should be noted, as should any subcostal/intercostal retractions. Asymmetric expansion may be seen with a pneumothorax or diaphragmatic paralysis. Abnormal shapes (e.g., pectus excavatum or pectus carinatum) should be noted. Barrel-shaped chests are sometimes seen in patients with chronic obstructive pulmonary disease (e.g., chronic asthma or cystic fibrosis). A rachitic rosary may be seen or palpated in rickets. Widely-spaced nipples may be a sign of Turner syndrome. The pubertal development of the breasts (Tanner staging) should be noted in females. Any masses, tenderness, or discharge should be described in detail; diagrams are often useful, as well. Beast buds are commonly seen in neonates. The integrity of the clavicles should be noted in newborns. Males sometimes develop unilateral or bilateral breast hypertrophy during puberty.

Cardiovascular

A bell or diaphragm of the appropriate size should be used. Frequently, an adult stethoscope can be used once the child is out of the immediate newborn period. Remember that the diaphragm should be applied firmly to the chest while the bell should be applied lightly. The PMI (point of maximal impulse) should be noted with respect to

location and intensity. A right-sided PMI may be associated with situs inversus (and further imaging of the spleen may be indicated).

The regularity of the cardiac pulse, S1/S2 and any murmurs should be described with special attention to the phase of the cardiac cycle, character (e.g., crescendo/decrescendo, regurgitant), intensity (remember that the difference between a grade III/VI murmur and a Grade IV/VI murmur is a palpable thrill felt in Grade IV), radiation to the axillae, neck, or back, and changes with position. Sinus arrythmia is commonly seen in children, as is a physiologically split S2. Any rubs, clicks, or gallops should be noted. A prominent S1 is heard with mitral stenosis; a prominent S2 may be heard with pulmonary hypertension. Innocent heart murmurs are low grade, often heard as a vibratory/musical sound at the apex or left sternal border (Still's), low grade systolic at the left sternal border (pulmonary flow), or below either clavicle and decreasing with neck movement or supine position (venous hum).

Lungs

A bell or diaphragm of the appropriate size should be used. Frequently, an adult stethoscope can be used once the child is out of the immediate newborn period. The clarity of the breath sounds and the quality of air movement should be noted. Any wheezing, rhonchi, rales, or transmitted upper airway sounds should be recorded. An increased inspiratory:expiratory ratio is an indication of small airways bronchospasm. Since airway sounds are transmitted better through a smaller chest, the exam can be somewhat confusing at times. Fremitus, whispered pectoriloquy, and percussion are more useful in older children and adolescents than in infants and younger children.

Abdomen

Inspection is the most important first step. A scaphoid abdomen can be a sign of an obstruction or a diaphragmatic hernia. Occasionally, peristaltic waves may be seen after a feeding if a patient has an obstruction such as pyloric stenosis. Ventral hernias and diastasis recti are not uncommon in the neonatal period. Prune belly syndrome has a characteristic appearance and is associated with a host of abdominal abnormalities. The umbilicus should be inspected for drainage or erythema before the umbilical cord falls off, as these might be signs of an infection. Umbilical drainage after the cord falls off may be a sign of a patent urachus or an omphalomesenteric duct remnant, depending on whether the connection is to the bladder or the intestine, respectively. On the newborn exam, the number of umbilical vessels (one vein and two arteries) should also be noted, as a single umbilical artery can be associated with other disorders. An umbilical hernia should be noted for its size and ease of reduction. A distended abdomen may signify an obstruction, infection, celiac disease, ascites, or an abdominal mass. Asking a cooperative patient to cough can reveal sources of rebound tenderness. The abdomen should be auscultated for the quality of bowel sounds.

Palpation will reveal masses (size and location should be specifically noted), hepatosplenomegaly, and any sources of pain (classified as either occurring with direct

palpation or as rebound tenderness). If the liver is felt below the costal margin (it commonly is 1 cm below the margin), its span in the midclavicular line should be percussed (normal values for liver span size can be found in reference books). Pyloric stenosis is most commonly seen between 4-8 weeks of life. One way to palpate a hypertrophic pylorus (the "olive") is to drape the infant over the examiner's hand while holding him prone. Abdominal palpation can be enhanced by having the child hold the examiner's hand (i.e., the hand being used to examine the abdomen). The thin child may have to bend her knees to allow a thorough exam. Murphy's sign is RUQ tenderness and hesitation on deep inspiration (suggestive of acute cholecystitis). Danforth's sign is right shoulder pain with RUQ palpation (represents an irritated diaphragm). Kehr's sign is left shoulder pain with LUQ palpation (represents an irritated diaphragm). Fitz-Hugh-Curtis syndrome is pain caused by perihepatic inflammation from pelvic inflammatory disease. Rovsing's sign is RLQ pain with LLQ palpation (suggestive of appendicitis). McBurney's point is 2/3 of the way from the umbilicus to the anterior superior iliac crest in the RLQ and tenderness there is also suggestive of an acute appendicitis.

Genitourinary

In a female, the normal external anatomy should be noted, as should the Tanner stage for pubic hair. Clitoromegaly is one sign of virilization. A change in the appearance of the vaginal mucosa is a sign of estrogenization (from red and shiny in the prepubescent girl to pink and dull in the estrogenized state). Any nonphysiologic discharge or drainage should be noted and cultured. Many infectious organisms and environmental irritants can cause vaginitis. It is not uncommon for a neonate to have menses (these are associated with maternal hormone withdrawal). Labial adhesions are not uncommon and can be treated. An amenorrheic female should be examined for an imperforate vagina. Any evidence of trauma should be noted. Pelvic exams are rarely performed in prepubescent females. One way to approach an abdominal mass using the bimanual method is via a rectal exam (vs. doing a pelvic exam). In most cases, however, imaging alone is adequate to characterize these masses. Pelvic exams are routinely performed after 18 years (this sometimes varies by location and circumstance), in sexually active females, and in an adolescent with a vaginal discharge, dysuria, or abdominal pain. Urethral prolapse is a common cause of blood in a girl's diaper or panties.

In a male, the normal external anatomy includes a normally positioned urethra. Hypospadias and epispadias are abnormal and can be associated with other genitourinary or pelvic abnormalities, depending on their severity. The phallus should be normal length (normal values can be found in reference books). A prominent fat pad is the most common cause of a concealed penis. Microphallus can be associated with growth hormone deficiency. The foreskin should be retractable by 4-6 years. Parents should not forcibly retract the foreskin. A phimosis or paraphimosis is an emergency and needs to be addressed immediately. Balanitis is not uncommon in young children. A "shawl scrotum" can be associated with certain syndromes but may be a normal variant. The testicles should be in the scrotum. There should be a distinction made between retractile and undescended testes. Warm hands and a gentle approach are necessary for this exam. Having the child sit up with the knees bent may help the testis descend. Using a lubricant

and gently milking the testis through the inguinal canal (working cephalad to caudad) may also be necessary. Testicles should stay in the scrotum by 12 months but some urologists prefer to see these patients as early as nine months of age. Hydroceles are fairly common in neonates. They should resolve by 12 months of age. Scrotal hernias should be noted in size and ease of reducibility. Any signs of incarceration need to be addressed emergently. Testicular torsion is fairly common and should be addressed urgently. Scrotal pain may also be referred from the abdomen. A "blue dot" sign near the epididymis is seen with a torsed appendix testis. Newborns frequently have scrotal edema – this normally resolves in a few weeks.

Signs of precocious pubertal development mandate a search for other signs of virilization of estrogenization.

Rectal

This fairly invasive exam should be discussed first with both the patient and the parent. A chaperone may be necessary. The anus should be inspected for position (an imperforate anus is associated with a host of other anomalies; an abnormally places anus can also be associated with constipation or encopresis, depending on the position of the orifice with respect to the sphincter). Any fissures, trauma, or parasites should be noted. A rectal prolapse may be seen with many conditions including malnutrition, constipation, and cystic fibrosis. The rectal exam is mandatory for any child complaining of abdominal pain, encopresis, constipation, hematochezia, or melena. A lubricated small finger is used to palpate for any masses (including stool in the rectal vault), tone of the sphincter, and any focal pain, as may be seen with appendicitis. The stool should be tested for occult blood.

Skin

Skin lesions should be described using standard dermatologic nomenclature including the size, type, color, and distribution of the lesion, (e.g., 1 mm red papules in the intertriginous area of the neck). Primary skin lesions include macules, papules, plaques, nodules, wheals, vesicles, cysts, and pustules. Secondary changes include erosion, oozing, crusting, scaling, atrophy, excoriation, and fissuring. Lesions are arranged in the following manners: discrete, linear, annular, or grouped.

Skin turgor and general color should also be noted. Jaundice in a newborn less than 24 hours old and greater than 2 weeks old always needs to be assessed – the possibilities of pathologic jaundice and biliary atresia need to be ruled out, respectively. The regularity of the borders of nevi or café au lait spots should also be noted. The examiner should always be aware of the location of lesions attributed to trauma – the location of these lesions can often aid in determining whether a lesion was accidental. Common findings include hemangiomas and Mongolian spots. As infants usually do not stand, the skin in dependent areas should be examined for edema.

Extremities/Back

The extremities should be examined for clubbing, cyanosis, or edema. Acrocyanosis is a common finding in neonates. Any deformities or extra digits should be noted. Hemihypertrophy may be subtle; examining the same nail on opposite sides is an easy way to examine for this. It may be associated with other syndromes or may stand alone as a finding. Subcutaneous nodules may be seen with certain rheumatologic disorders.

Fractures should be described using standard orthopedic terminology with respect to location, displacement, and angulation. Range of motion, swelling, erythema, and warmth should be noted for any joints of concern. The hips are routinely examined in infants. Galeazzi's sign describes the equality of knee height when the infant is supine and the knees are bent – they should be equal. Each hip should be examined independently. Barlow's sign describes the ability to dislocate a hip; Ortolani's sign describes the ability to relocate the hip. Either one is abnormal. The ability to fully abduct each hip (with the knee flexed) should also be noted; any limitation may be a sign of developmental dysplasia of the hip (DDH) or trauma. Any asymmetry of the skin folds in the thigh should be noted, as this may be a sign of DDH.

Genu valgum and genu varum are common complaints that may be physiologic or may need further evaluation. Rotational deformities of the lower extremities are not uncommon in infants and children. A rotational profile, including internal/external rotation of the hips, thigh foot angle, foot progression angle, and a description of the foot is necessary to locate the site of the abnormality. Age-dependent normal values exist for each of these angles. Metatarsus adductus is the most common cause of intoeing in infancy; tibial torsion becomes more common later in childhood. Foot abnormalities are common in infancy but not in later life. Metatarsus adductus (a forefoot abnormality) is commonly seen in newborns but needs to be distinguished from clubfoot (a hindfoot disorder with serious systemic implications). Calcaneovalgus is also fairly common. Limb-length discrepancies can be measured using true (anterior superior iliac crest to medial malleolus of the ankle) or apparent (umbilicus to medial malleolus of the ankle) measurements. Examining the patient's relative hip height from behind is also useful in describing a limb length discrepancy. Various other orthopedic maneuvers can be performed in children, as well (e.g., the Lachman test).

The intensity of peripheral pulses, especially the femoral pulses, should be described. Any lag between the brachial and femoral pulses, or decreased femoral pulses, may be a sign of coarctation of the aorta.

The fingers and hands should be examined for abnormalities, including clinodactyly, syndactyly, nail spooning or pitting, splinter hemorrhages, finger segment length, and dermatoglyphics.

The back should be examined for the normal curves, which change as the child ages. Any scoliosis or kyphosis (position and degree of deformity) should be noted. Having the patient bend at the waist and examining her from behind looking at the height of the scapulae (relative to each other) is a common way to examine for scoliosis. The presence

of a gibbus deformity is pathologic, as is a buffalo hump (rarely seen in children). Pits, hemangiomas, hair patches, and fatty collections are all abnormal when found above the level of the gluteal folds. Pits with distinct bases are fairly common below the level of the gluteal folds and do not need further investigation. Any pain over the costovertebral angle should be noted.

Lymphatics

The location, size, mobility, and consistency of lymph nodes should be recorded. Anterior cervical and inguinal lymphadenopathy (< 1 cm) are common. Parents occasionally ask about occipital lymph nodes. The peak of lymphatic tissue growth is around 12 years. Posterior cervical adenopathy can be associated with various viral infections (including HIV), leukemia, lymphoma, otitis, mastoiditis, or scalp infections (e.g., tinea capitis). Enlarged occipital nodes may be seen with scalp infections. Preauricular nodes may be a sign of keratoconjunctivitis. Lymph nodes are only rarely felt in the supraclavicular, infraclavicular, epitrochlear, and popliteal areas, so their presence needs to be further addressed.

Neurologic

Much of the neurologic exam comes from observation of the child. Any limitation in the use of the hands, legs, or postural muscles needs further investigation. Most children over the age of four years can comply with a full neurologic exam.

In infancy, the symmetry of the facies, palate, tongue, and extraocular movements should be observed, as should the pupillary light response. The vestibular response (with the infant in the upright position, being rotated; this can be accomplished at the same time as the "slip-through" test) can be assessed. Neck position should be noted. The spontaneity of the extremity movement and provocative maneuvers (such as the Moro reflex) should be recorded. Muscle mass and tone (both appendicular resistance to passive stretch and the axial response to prone suspension or, alternatively, the "slip-through" test) are important to note. Head lag is common until three to four months of age. By two months, the hand should be unfisted approximately half of the time. The sensory response to pain is easy to elicit but finding a sensory level can be more challenging. Deep tendon reflexes are graded as they are in adults (2+ is normal). Up to ten beats of ankle clonus is not uncommon in neonates. The presence or absence of primitive reflexes changes with varying ages and can be found in many references. The stepping and placing reflexes, though entertaining, are only somewhat useful to document the integrity of the spinal cord and peripheral connections.

As the child matures, the mental status exam becomes more important. The cranial nerves are examined next. Visual acuity should be documented in children old enough to comply with the exam. Pupil size and reactivity to light and accomodation and extraocular movements indicate the integrity of CN III, IV, and VI. CN V is tested through strength of the muscles of mastication and the symmetry of facial sensation in each branch, as well as the corneal reflex. CN VII is tested with symmetric facial

movements and noting the symmetry of the nasolabial folds; central (nuclear) and peripheral lesions should be distinguished from one another. CN VIII is tested via hearing tests and the use of the Weber and Rinne tests. CN IX and X are tested with the symmetry of palatal movements; CN XI is tested with the strength of the symmetry of neck rotation while CN XII is tested with symmetry of tongue movements. The tongue should also be evaluated for fasciculations.

Motor strength is graded as in adults on a 5-point scale. The muscle mass and tone should be noted. Pronator drift can be tested. Repetitive (e.g., athetosis, chorea, tremors, or tics) or ballistic mannerisms should be noted. Occasionally, stereotyped movements are incorporated into a normal motor movement, such as chorea being stereotyped into touching the hair. A Gower's sign may be elicited if proximal muscle weakness is present. Sensation can be tested with light touch, pinprick (with a broken tongue depressor), two-point discrimination, joint position and vibratory senses, and with temperature variation. An older child may comply with an exam for graphesthesia and stereognosis. Finding a sensory level can be critical in distinguishing Guillain-Barre from transverse myelitis. The Romberg sign can be elicited. An anal wink should be elicited if spinal cord pathology is suspected. Abdominal and cremasteric reflexes may also be useful. Deep tendon reflexes are graded as in adults. It is often easier to strike a finger placed over a tendon than the tendon itself. The Babinski sign is elicited as it is in adults; alternative maneuvers are the Oppenheim (stroking the anterior tibia) and Chaddock (stroking the lateral edge of the foot) signs, since the nociceptive response is very strong in infants and children. The trunk incurvation reflex (Galant's) is elicited by stroking the paravertebral area while holding the infant prone in one hand; an intact spinal cord will produce incurvation toward the stroked side. The cerebellar exam (finger-finger-nose, heel-knee-shin, and rapid alternating movements) is important and is a fun part of the exam for most children. The gait (walking and running) should be examined. The Trendelenburg sign may be the only indication of muscle weakness.

Additional components of the neonatal exam

Neonates are frequently examined for physical and neuromuscular maturity using various scales (such as the Ballard). In neonates who are sedated or hypotonic from a perinatal insult, the physical maturity score is doubled, as the neuromuscular exam is unreliable. The score is then converted to an estimated gestational age (EGA) using a standard scale. If the EGA by dates is within two weeks of the calculated EGA, the EGA by dates is used to describe the maturity of the infant. If they differ by more than two weeks, the calculated EGA is used.

Laboratory/Radiology Data

Any studies performed on the patient should be listed. Abnormalities should be highlighted and discussed with the remainder of the case.

Impression

A diagnostic impression should be developed. A problem list can be useful for beginners to try to synthesize a patient's findings into a coherent diagnosis. One useful way to synthesize this information is to first describe the anatomy of each abnormality, then to describe the pathologic process (e.g., neoplastic, inflammatory, infectious), finally arriving at a coherent diagnosis. The cycle of data collection, hypothesis setting, hypothesis testing, and action is put into place. The selection of a diagnostic pivot, or unique finding, may assist in narrowing down the differential diagnosis. The rules of parsimony, chronology, and plausibility should be remembered. Common diagnostic errors, such as premature closure (i.e., reaching a conclusion before there is enough data to support it) should be avoided. Common and catastrophic diagnoses are the most important ones to address.

Plan

A diagnostic and therapeutic plan should address each diagnostic impression. Tests should be ordered only if the result will alter the plan. Pediatricians tend to be fairly conservative in prescribing medication, especially for self-limited diseases, such as the common cold. One useful way to delineate a plan is by systems (e,g., cardiovascular, pulmonary, hematologic, infectious, fluid/electrolytes/nutrition, etc.).

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